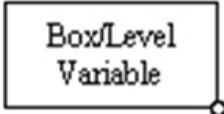
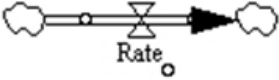




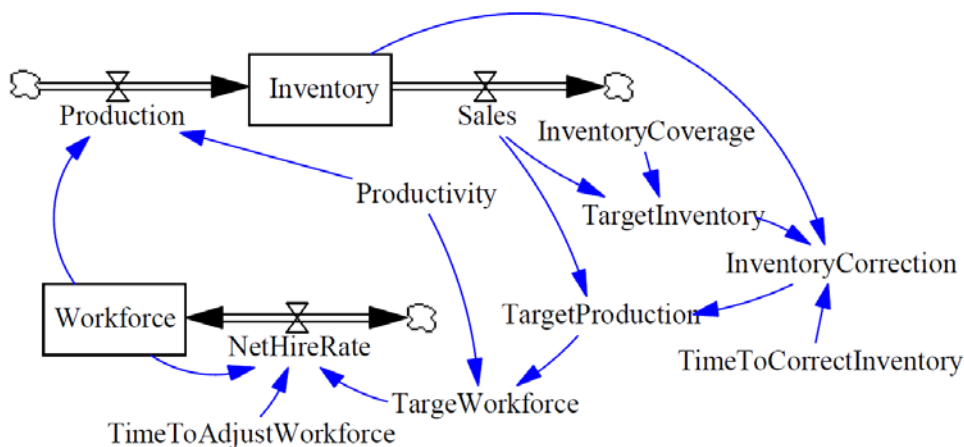


Sheet #1 (Modeling with Vensim)

1)

 <p>Box/Level Variable</p>	<p>Box Variables represent quantities. These are the main "nouns" in a system and are sometimes referred to as Level Variables.</p>
 <p>Rate</p>	<p>Rates represent changes over time. These are the main "verbs" in a system and are sometimes referred to as Flows.</p>
 <p>Auxiliary Variable</p>	<p>Auxiliary Variables represent constants and other parameters. These loosely correspond to "adjectives" and "adverbs" in a system.</p>
	<p>Connectors indicate dependencies between objects. In other words, I need to know this to calculate that.</p>

2)



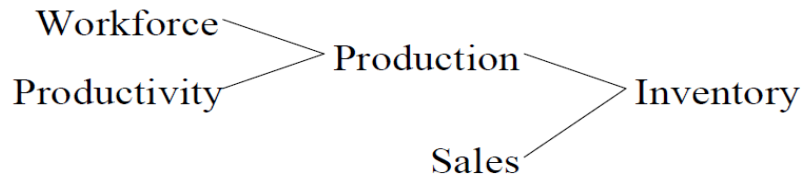
Answer :

There are two stocks :

1-Inventory .

2-Workforce .

First : Inventory



Inventory — InventoryCorrection — TargetProduction

Loop Number 1 of length 6

Inventory

InventoryCorrection

TargetProduction

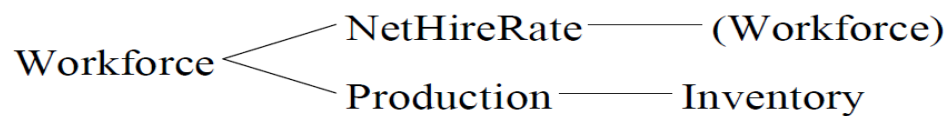
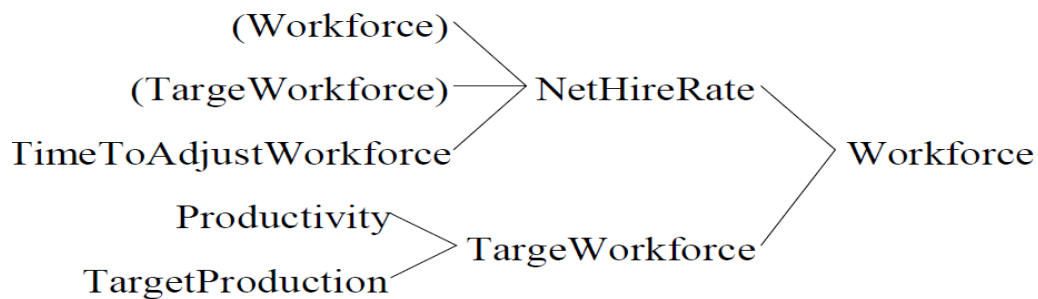
TargeWorkforce

NetHireRate

Workforce

Production

Second :Workforce



Loop Number 1 of length 1

Workforce

NetHireRate

Loop Number 2 of length 6

Workforce

Production

Inventory

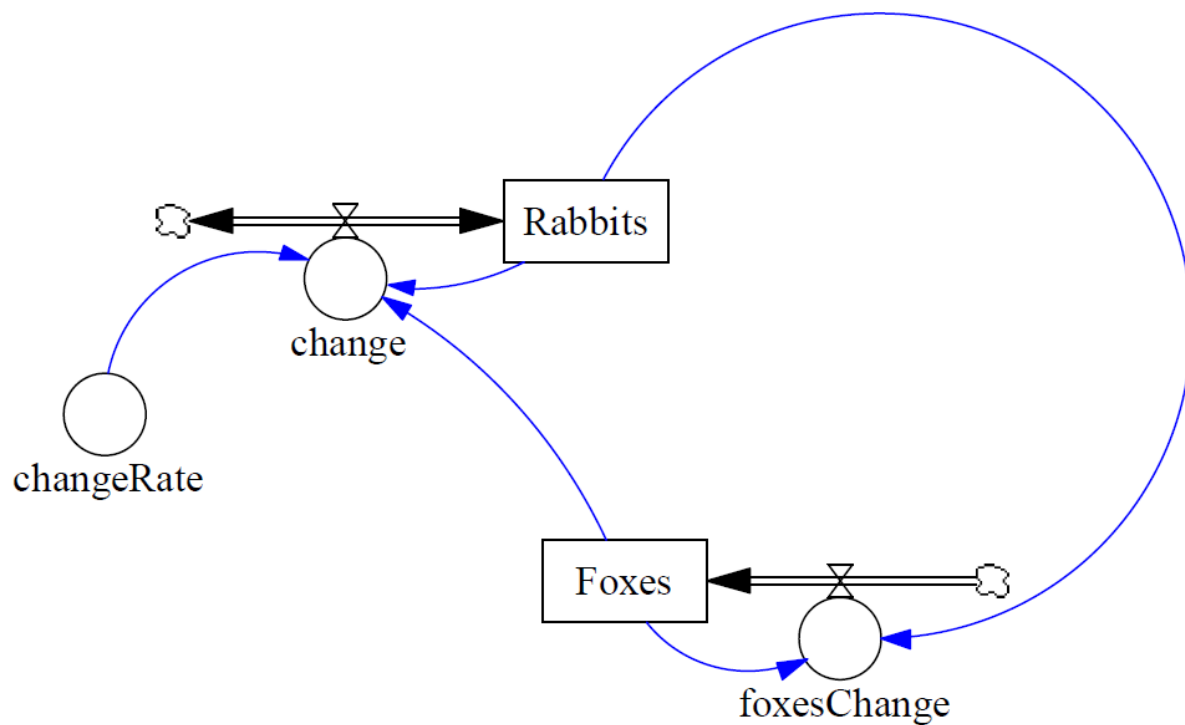
InventoryCorrection

TargetProduction

TargeWorkforce

NetHireRate

3)

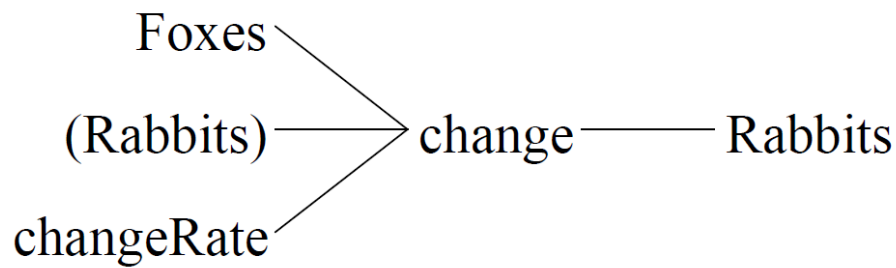


$$R(t)=R(t-1)+G[1-R(t-1)/500]R(t-1)-0.0001R(t-1)F(t-1)$$

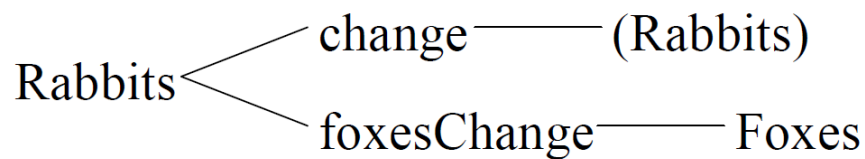
$$F(t)=F(t-1)+0.0001R(t-1)F(t-1)-0.02F(t-1)$$

First : Rabbits

Causes tree :



Uses tree :



Loop Number 1 of length 1

Rabbits

Change

Loop Number 2 of length 3

Rabbits

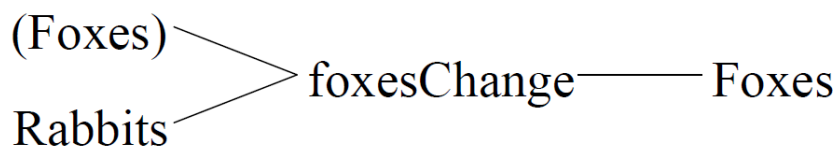
foxesChange

Foxes

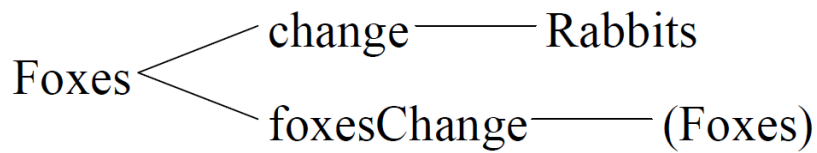
Change

Second :Foxses

Causes tree :



Uses tree :



Feedback loops :

Loop Number 1 of length 1

Foxes

foxesChange

Loop Number 2 of length 3

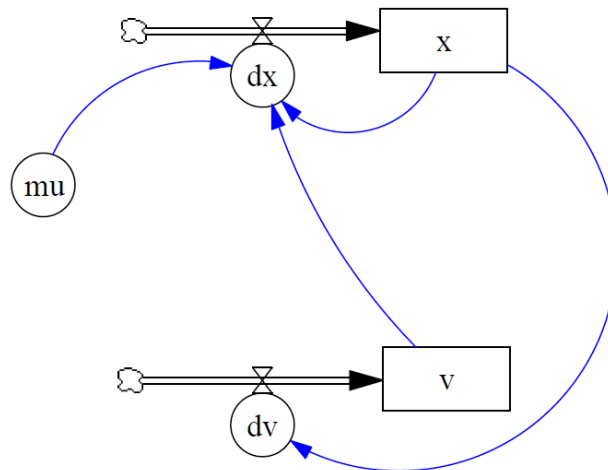
Foxes

change

Rabbits

FoxesChange

4)



01) $dv = -x$ Units: microgm/sec

02) $dx = v - \mu * (((x^3)/3) - x)$ Units: cm/sec

03) FINAL TIME = 100 Units: Second The final time for the simulation.

04) INITIAL TIME = 0 Units: Second The initial time for the simulation.

05) $\mu = 2$ Units: cm/sec

06) SAVEPER = TIME STEP Units: Second

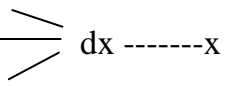
The frequency with which output is stored.

(07) TIME STEP = 0.1 Units: Second The time step for the simulation.

08) $v = \text{INTEG} (\quad dv, 1)$ Units: microgm

09) $x = \text{INTEG} (\quad dx, 2)$ Units: cm

Causes tree for x

Mu 

uses tree for x

x----dx-----x
x-----dv---v

Causes tree for v

x----dv-----v
uses tree for v
v----dx-----x

feedback loops :

loop 1 of length 1

x

dx

loop 2 of length 3

x

dv

v

dx

loop 3 of length 3

v

dx

x

dv